



OUR ENVIRONMENT

Environment literally means everything in our surroundings. How do you define our environment? Our environment includes the physical (nonliving or abiotic) and biotic (living) components which influence with each other including ourself. It also provides us all the materials required for our survival and comfort. The growth of human population increases the demand for food, water, shelter, electricity, roads, automobiles and numerous other commodities. These demands exert a tremendous pressure on our natural resources and bring about undesirable changes in physical, chemical and biological characteristics of our environment. The need of the hour is to check the degradation and depletion of our precious natural resources and undesirable change of our environment without halting the process of development.

In order to control environmental degradation, the Government of India had passed the Environment (Protection) Act, 1986 to protect and improve the quality of our environment (air, water and soil).

We shall now see how the various factors of the environment interact with each other and how human activities affect their cycles.

17.1. What happens if we bury different materials in the soil?

A lot of materials in the form of solid waste and sewage (liquid form of waste) are added to the environment due to our daily activities. It is beyond the capacity of nature to degrade many of these. These materials create a great problem in our natural environment if they are not properly managed.

What happens to the waste materials that we throw away in our surroundings? Let us perform an activity to find out the answer to these questions.

Activity 17.1.

- ☞ Collect all the solid waste materials produced in a day at your home. They include kitchen waste (mostly organic), paper, plastic, glass, leather, old and torn cloths, metals etc.
- ☞ Bury them in a pit in your garden or in a bucket or flower pot and cover with at least 15 cm of soil.

- ☞ Observe the buried materials after an interval of 15 days and keep them moist.
- ☞ What are the materials which changes their form and structure over time?
- ☞ What are the materials that remain unchanged over long periods of time ?
- ☞ Which ones change the fastest ?

The food we eat is digested by various enzymes in our body. Various enzymatic activities are also taking place in the degradation of these waste materials. Enzymes are specific in their action, i.e. specific enzymes are needed for the breakdown of a particular substance. Organic matters are easily broken down in nature whereas many man made materials like plastics are not easily acted upon by micro-organisms. They are slowly broken down by physical processes like heat and pressure.

Substances that can be broken down naturally into harmless products are called biodegradable substances. In the above activity, how many of the substances are biodegradable ?

Substances which can not easily broken down into harmless products through biological processes, are called non-biodegradable substances.

Activity 17.2.

- ☞ Collect more information about biodegradable and non-biodegradable substances by using library or internet.
- ☞ How long are various non-biodegradable substances expected to last in our environment.
- ☞ Find out more about such materials which do not harm the environment.



Fig. 17.1. Solid waste at Imphal

Let us study some of the various waste products and their mode of disposal in various parts of Manipur.

In Fig. 17.1, we can see various forms of solid waste collected from an area of Imphal, the capital city of Manipur. Make a list of the biodegradable and non-biodegradable substances present in it. Can you expect the same type of materials in all the other areas of this state?

Facilities for effective collection and disposal of waste are very much inadequate in all towns resulting to a large proportion of these remaining uncollected. There is no specific landfill site for disposal. As a result the waste is dumped at unspecified places in unscientific manners.

The average output of waste is around 120 tones per day in Imphal city area. Most of these wastes are dumped into the Naga and Nambul rivers, while some portion are disposed at Lamphel and other low lying areas. (Fig.17.2.).



a. Naga River



b. Nambul River



c. Lamphel Area

Fig. 17.2. Solid wastes disposal

Characterisation of solid Waste materials (Imphal)

Component	Percentage
Organic Waste :	60
Paper :	10
Plastic :	05
Glass :	02
Leather :	01
Textile :	05
Rubber :	01
Wood :	05
Porcelain/Stone/Clay :	03
Metals :	01
Fine Fractions (<10 mm) :	07

Source : State of Environment Report - Manipur, 2004.

Let us answer these.

1. Why are some substances biodegradable and some non-biodegradable ?
2. Explain how biodegradable substances would affect the environment ?
3. Explain how non-biodegradable substances would affect the environment ?

17.2. Ecosystem and its components

Organisms and environment are two nonseparable factors. Organisms interact with each other and also with the physical factors that are present in the environment.

The interacting organisms in an area together with the nonliving components of the environment form an ecological system or ecosystem.

The biotic components consists of micro-organisms, plants and animals, including human being. The abiotic components comprise physical factors like temperature, rainfall, wind, soil and minerals.

In a garden you will find different plants such as grasses, trees, rose, jasmine, banana trees, etc. and animals like frogs, lizards, insects, birds etc. All these living organisms interact with each other. Their growth, reproduction and other biological activities are also affected by the nonliving components of the ecosystem. Grasslands, forests, ponds and lakes are natural ecosystems while gardens and crop-fields are man made (artificial) ecosystems. The earth is also a big ecosystem.

17.2.1. Food chains

In an ecosystem, green plants, which are known as producers trap solar energy and convert it into chemical energy. The food or chemical energy manufactured by the green plants is utilized by themselves and also by plant eating organisms or **herbivores**. Herbivores fall prey to some carnivorous animals. Thus, the food energy passes from one population to the other population, in this way a chain is established. This is known as **food chain**. (Fig.17.3.). The various steps/ levels through which the food energy passes are called **trophic levels**. (Fig. 17.4.).

Producers represent the first trophic level. Herbivores and consumers of the first order constitute the second trophic level/primary consumers. Consumers of second order or primary carnivores form the third trophic level/secondary consumers. The ultimate carnivores which are not eaten by others are called top carnivores/tertiary consumers. They represent the fourth trophic level.

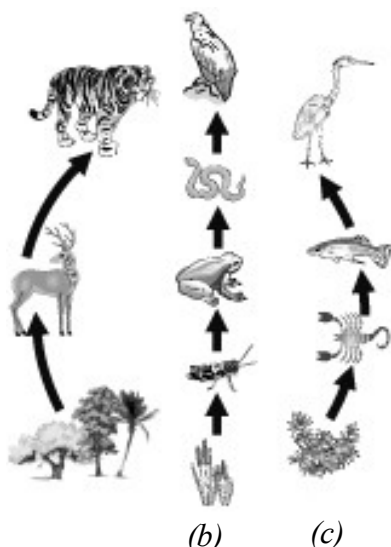


Fig. 17.3. Food chain in nature
 (a) in forest
 (b) in grassland and
 (c) in a pond

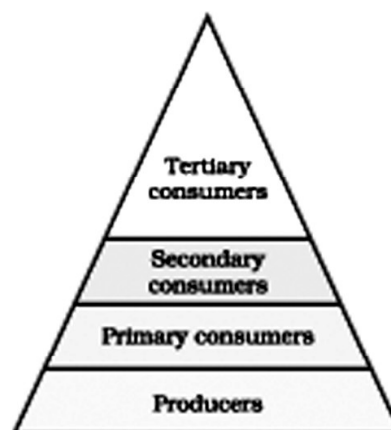


Fig. 17.4. Trophic levels

There is another group of organisms which live on organic wastes, dead and decomposing animal bodies. Vultures, feed on dead animal body. They are called **scavengers**. Decomposers are also another category of scavengers which live on the dead bodies of plants and animals. While scavenging they break down the bodies and thus become agents of decay. The materials in the dead bodies are converted into organic and inorganic substances. Thus they make soil fertile and make these substances available for the producers. Men eat plant and animal parts as their food, and hence they are **omnivores**.

17.2.2. Food Webs

Food does not always pass from one population to another in a linear sequence as in a food chain. Instead several food chains are linked together in a web-like manner, thus constituting a food web. Thus, a food web is the interlocking of different food chains by developing interconnections at various trophic levels so as to form a number of feeding interaction in a biotic community (Fig. 17.5.).

Human beings occupy the top level in any food chain. They can not be classify either as herbivores or carnivores. There are people who live on plant products only. Yet many others favour non-vegetarian food (live on animal products). What about other animals like insects, rabbits, goats, cows etc. who

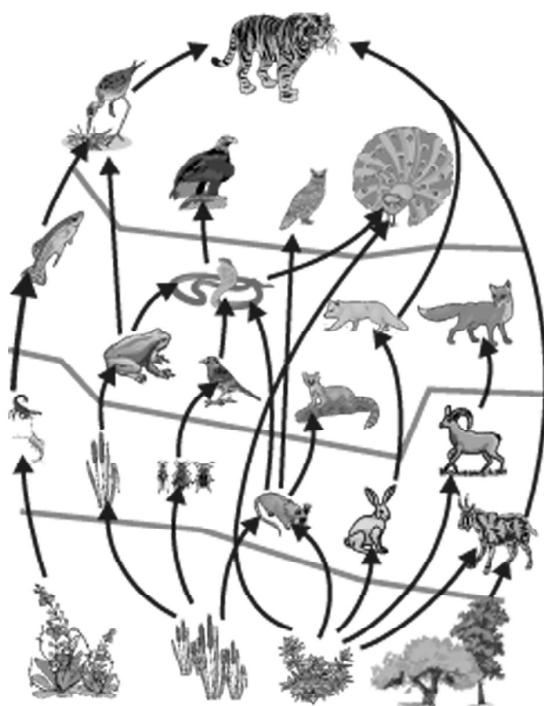


Fig.17.5. Food web

feed grasses. Frogs and toads live on insects. Many small birds feed on insects and plants. Snakes feed on frogs, birds, rabbits etc. Elephant is a plant eater. Tiger and Lion live on other animals as their prey. In which trophic level cats and dogs are included?

Activity 17.3.

- ☞ Write down the common names of any five producers (green plants) you had come across in class -IX.
- ☞ Which animals are consumers of first order? Give the names of any five animals.
- ☞ Write the names of any five animals included in the second order of consumers.
- ☞ Find out the names of any three top carnivores.

In the above activity you classify the plants and animals as producers and consumers of different orders. Is there any plant in the consumer's level or any animal in the producer's level? Can you identify more plants and animals in different trophic levels?

17.2.3. What will happen if we kill all insects?

Give the common names of any two insects which are harmful to man and to our crop plants. Mosquito & housefly suck human blood and can spread malaria and other killer diseases. Grasshopper and thrips cause great loss to our crop plants.

In food chain of ecosystem, insects are good prey for many other animals like spiders, toads and birds. Honeybee gives us honey. During the collection of nectar, they pollinate flowers. Insects are best pollinators and also help in the dispersal of spores. Insect larvae are used as food by animals including man. Caterpillars have medicinal values.

Let us answer these.

1. Describe the various components of an ecosystem.
2. Give the names of any three natural ecosystem.
3. How does sun act as the source of energy for all the organisations on earth?
4. How does food chain differ from food web ?
5. Give two functions of insects in our ecosystem.

17.3. How do our activities affect the environment ?

We are an integral part of the environment. Changes in the environment affect us and our activities change the environment around us. Over and above the problem of waste disposal, let us look to other problems caused by our industrial development e.g. depletion of ozone layer.

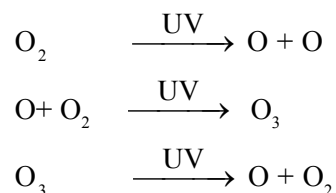
17.3.1. Ozone depletion

Ozone is a deadly poisonous gas formed by three atoms of oxygen i.e. O_3 . At the higher levels of the atmosphere, ozone performs an essential function.

Ozone filters away the ultraviolet radiation from the sun and protects the earth from its harmful effect. Thus, it acts as a protective shield.

Ozone is an unstable gas and for both its formation and destruction, UV rays are essential which comes from the sun.

The following reactions are involved



This is a continuous process. But the amount of ozone in the atmosphere began to drop sharply since 1980s.

17.3.2. Depletion of ozone layer allows harmful ultraviolet rays to reach the part of earth

Sunburn, ageing, wrinkling of skin, cataract of eye, destruction of protein, mutation of genes leading to skin cancer or melanoma etc. are some of the effects of UV radiation to human population.

Thinning of ozone shield is caused by a number of synthetic chemicals like chlorofluorocarbons (CFCs), which are used as refrigerants and in fire extinguishers. In 1987, the United Nations Environment Programme (UNEP) succeeded in organising a conference to reduce the level of CFCs to 50 p.c. by 1999. All nations of the world has agreed to phase out their CFCs emissions in the year to come.

Activity 17.4.

- ☞ Collect more information about chemicals responsible for the depletion of the ozone layer through internet or newspaper report and library.
- ☞ Find out if the regulations put in place to control the emission of these chemicals have succeeded in reducing the damage of the ozone layer.
- ☞ Is there any improvement of ozone layer in recent years ?

Let us answer these.

1. What is ozone and how does it protect the organisms on earth ?
2. How can you help in improving the depleted ozone layer ?

POINTS TO REMEMBER

- ✱ Our environment is composed of biotic and abiotic components.
- ✱ The various components of an ecosystem are interdependent.
- ✱ The producers convert sunlight to energy to make it available for consumers.
- ✱ The energy is loss when passing from one trophic level to the next, this limits the number of trophic levels in a food chain.
- ✱ The solid waste we generate may be biodegradable or non-biodegradable.
- ✱ In Manipur the facilities for effective collection and disposal of waste are very much inadequate.
- ✱ Human activities create great impact on our environment.

- ✱ Chemicals like CFCs affect ozone layer. Ozone layer protects our environment from 'UV' radiation from the Sun. This could damage the environment and causes many diseases to human being.

EXERCISES

1. What are the impacts caused on the environment by the biodegradable and non-biodegradable wastes that we generate ?
2. How can you handle the problem of solid waste in Manipur ?
3. What are the causes and effects of O₃ layer depletion ?
4. Explain the role of decomposers in an ecosystem.
5. Can you imagine, what will happen if all the insects are eliminated from our environment ?
6. Draw and label a food chain system showing interrelationship among the producers, primary consumers and secondary consumers.

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